(12)UK Patent (19)GB (11)2 407 261 (13)B

(45) Date of publication: **14.09.2005**

(54) Title of the invention: A releasable attachment device for a dust-collecting receptacle of a vacuum cleaner cyclonic separator

(51) Int Cl[7]: **A47L** 9/16

(21) Application No: **0422050.5**

(22) Date of Filing: **04.10.2004**

(30) Priority Data:
(31) **200369641** (32) **07.10.2003** (33) **KR**

(43) Date A Publication: **27.04.2005**

(52) UK CL (Edition X):
A4F FFD FSCA

(56) Documents Cited:
GB 2401777 A **GB 2384974 A**

(58) Field of Search:
As for published application 2407261 A *viz:*
UK CL (Edition X) **A4F**
INT CL[7] **A47L**
Other:
updated as appropriate

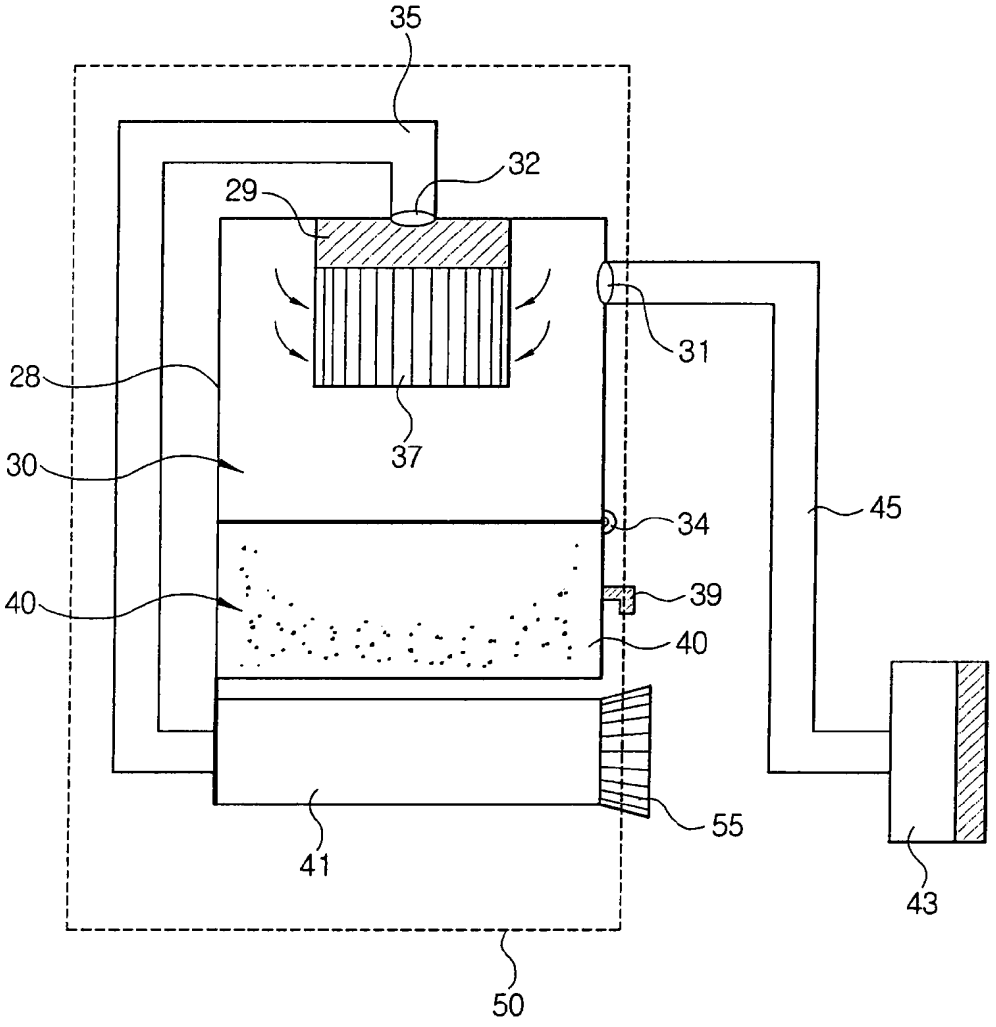
Additional Fields
Other: **Record no additional fields for B.**

(72) Inventor(s):
Il-won Yang
Dong-yun Lee

(73) Proprietor(s):
Samsung Gwangju Electronics Co., Ltd.
(Incorporated in the Republic of Korea)
271 Oseon-dong, Gwangsan-gu,
Gwangju-city, Republic of Korea

(74) Agent and/or Address for Service:
Withers & Rogers LLP
Goldings House, 2 Hays Lane, LONDON,
SE1 2HW, United Kingdom

FIG. 1



PRIOR ART

FIG. 2

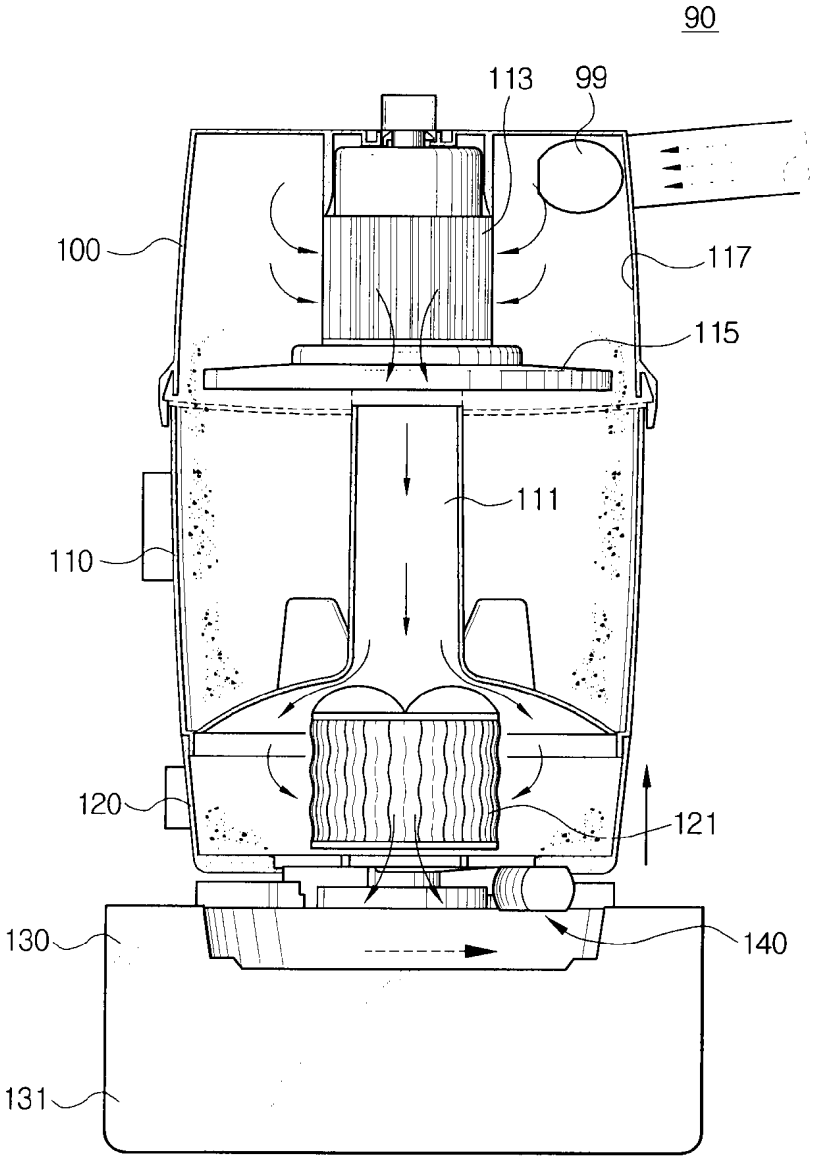


FIG. 3

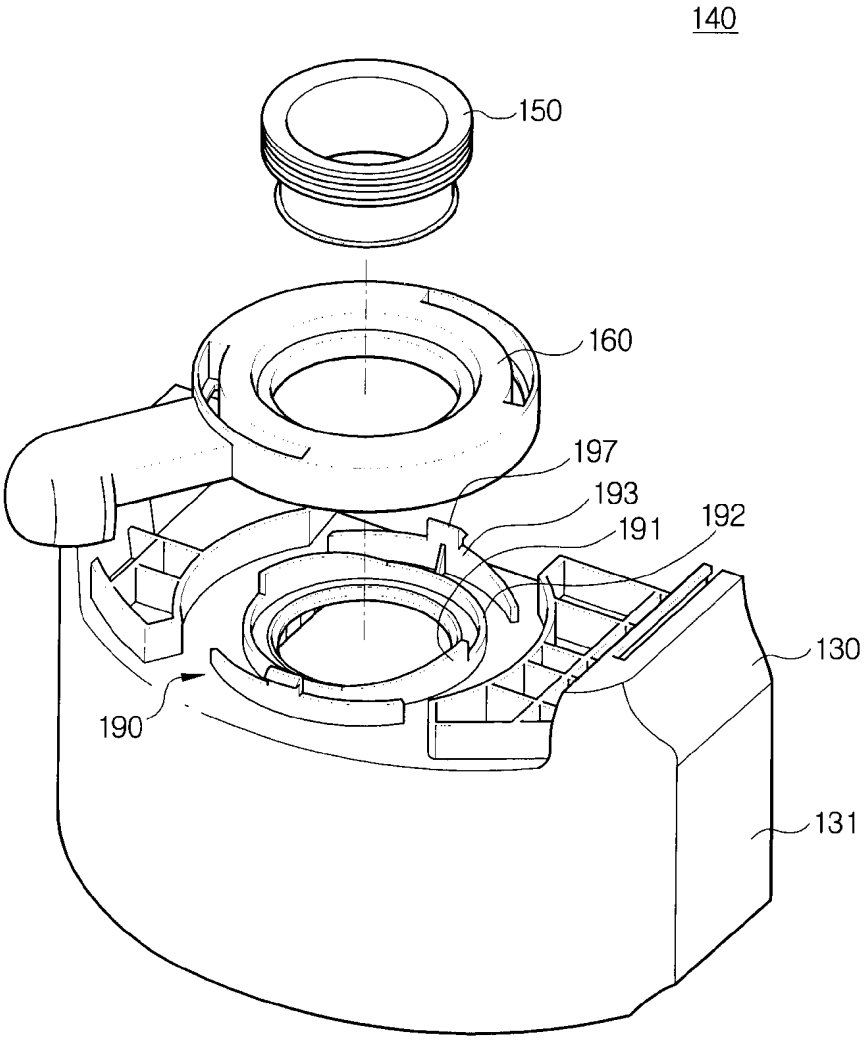


FIG. 4

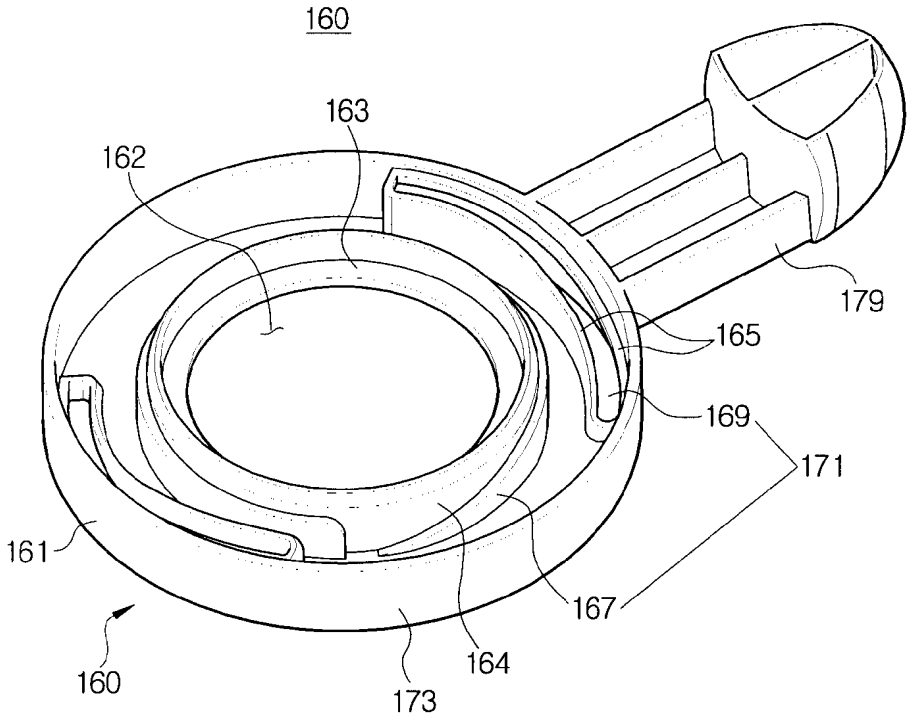

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FIG. 5

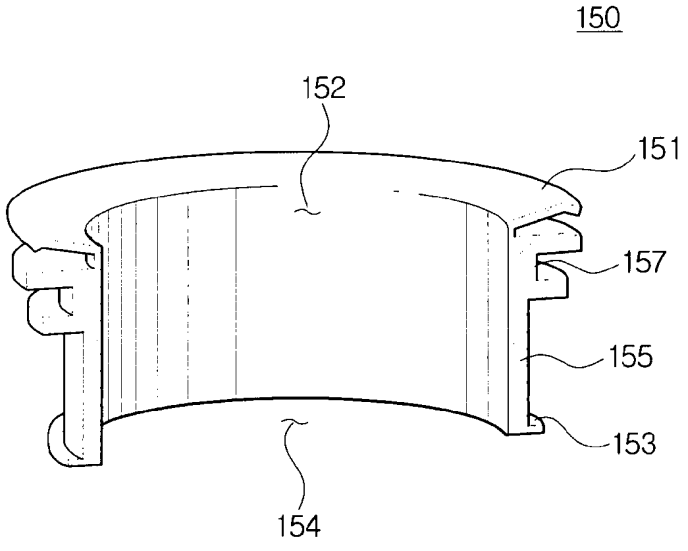
150
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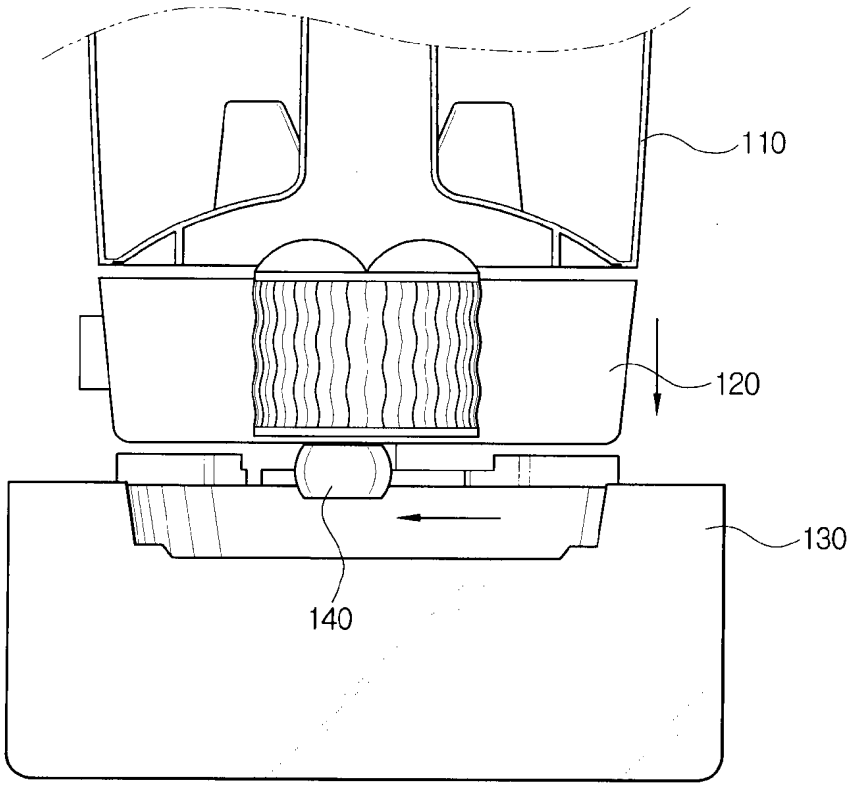
FIG. 6



A Releasable Attachment Device for a Dust-Collecting Receptacle of a Vacuum Cleaner Cyclonic Separator

This invention relates to a releasable attachment device for a dust-collecting receptacle of a vacuum cleaner cyclonic separator.

In general, a cyclonic separator centrifugally separates dust from dust-carrying air drawn into a vacuum cleaner, and discharges cleaned air. The cyclonic separator includes a dust-collecting receptacle, which collects the separated dust, and which is detachably coupled to the cyclonic separator.

The dust-collecting receptacle is attached to the cyclonic separator by means of a latch, and is detached by using a handle provided on the dust-collecting receptacle. This handle may be in the form of a drawer handle, the dust-collecting receptacle generally having a construction and operation similar to that of a drawer.

Figure 1 is a schematic view illustrating a cyclonic separator having this conventional type of attachment device, and shows a vacuum cleaner having a conventional cyclonic separator 30 and a dust-collecting receptacle 40 having the configuration of a drawer. The vacuum cleaner includes a cleaner body 50, shown by a broken line, and a nozzle unit 43 through which dust and dirt (hereinafter referred to as "dust") from a surface to be cleaned are drawn in with air.

The cleaner body 50 includes the cyclonic separator 30, the dust-collecting receptacle 40 which is releasably attachable to the cyclone separator, and a motor 41 that generates a suction force for drawing air into the vacuum cleaner. The cyclonic separator 30 includes a grille 37 disposed in a cyclone body 28 to provide a first means to filter the dust.

An air inlet 31 is formed at one side of the cyclone body 28, through which inlet the dust-carrying air is drawn in, and an air outlet 32 is formed adjacent to the top of the

cyclone body, through which outlet the cleaned air is discharged. Alternatively, the air outlet 32 is formed at one side of the cyclone body 28. The air inlet 31 is in fluid communication with the nozzle unit 43 through a flexible hose 45. The cyclonic separator 30 is well known to those skilled in the art, and thus a detailed description will be omitted for the sake of brevity. A filter 29 is interposed between the grille 37 and the air outlet 32.

The dust-collecting receptacle 40 is releasable latched to the cyclone body 28 by a latch 34. A knob 39 is formed at an outer side of the dust-collecting receptacle 40, so that, once the collecting receptacle 40 is unlatched, it can be withdrawn from the cyclone body 28 as if it were a drawer.

The air outlet 32 is in fluid communication with the motor 41 in the cleaner body 50 through a passage 35.

The operation of this vacuum cleaner is described below.

When the motor 41 is switched on, it generates a suction force, and air containing dust collected from the surface to be cleaned is drawn in through the nozzle unit 43. The air flows into the cyclone body 28 via the flexible hose 45, and the inlet 31 directs the air into the cyclone body 28 in a direction tangential to the wall thereof.

The drawn-in air thus forms a whirling air stream, and dust is separated from the whirling air by centrifugal force and is collected in the dust-collecting receptacle 40.

The air, from which dust has been removed, is discharged via the air outlet 32, first passing through the grille 37 and the filter 29. The grille 37 additionally separates fine dust from the "clean" air to prevent fine dust from being discharged out of the outlet 32.

The clean air discharged through the air outlet 32 flows to the motor 41 via the passage 35, and is discharged to the outside through a discharge grille 55 formed in a wall of the cleaner body 50.

When a predetermined amount of dust has been collected in the dust-collecting receptacle 40, the vacuum cleaner user detaches the dust-collecting receptacle 40 from the cyclone body 28 using the latch 34. This is accomplished by gripping the knob 39 connected to the dust-collecting receptacle 40, and sliding the dust-collecting receptacle from the cyclone body and from the cleaner body 50 as if sliding out a drawer. After disposing of the dust, the user reattaches the dust-collecting receptacle 40 to the cyclone body 28 and the cleaner body 50 for a further cleaning operation.

In detaching the dust-collecting receptacle 40 from the cyclone body 28 and the cleaner body 50 as if sliding out a drawer, several problems may occur, as described below.

After the dust is separated from the whirling air in the cyclone body 28, and the dust collected in the dust-collecting receptacle 40 exceeds a predetermined threshold, it becomes difficult to attach to the dust-collecting receptacle 40 to, and to detach it from, the cyclone body when only using the knob 39.

While attaching or detaching the dust-collecting receptacle 40, the collected dust can spill out from the receptacle, thus to dirty the user's hand or clothes and to cause other sanitary problems.

In view of the air flow path, the suction force generated by the motor 41 is not directly transferred to the cyclonic separator 30, since the suction force is transferred from the motor to the outlet 32 through the passage 35. Accordingly, fine dust may not be completely separated and filtered from the air stream, since the suction force is reduced, and the reduced suction force is not completely transferred to the filter 29.

An aim of the invention is to provide an improved releasable attachment device for a dust-collecting receptacle, so that a user can easily attach a dust-collecting receptacle to, or detach it from, a cyclonic separator, and to provide a motor-generated suction force that is directly transferred to the cyclonic separator.

The present invention provides a releasable attachment device for attaching a dust-collecting receptacle to a vacuum cleaner cyclone body, the device comprising:

a seal for sealing the dust-collecting receptacle with respect to part of the vacuum cleaner, the seal having a central through hole defining a fluid communication path;

a lever surrounding the seal; and

a guide member for guiding displacement of the lever,

wherein the lever is displaceable upwardly or downwardly depending on the direction its movement relative to the guide member.

The seal may comprise an annular sealing body having an inlet and an outlet, a first sealing part formed around the inlet, a second sealing part formed around the outlet, and a coupling rail formed around the sealing body to couple with the lever and seal thereagainst.

This releasable attachment device having a lever member that is vertically movable according to the movement of the guide member, with the guide member surrounding the seal, enables the dust-collecting receptacle to be releasably attached to, and detached from, the cyclone body.

The first and second sealing parts may protrude radially outwardly from an outer surface of the sealing body. The lever may comprise a lever body having a through hole for receiving the seal, and an annular flange formed around the through hole of the lever body to engage with the coupling rail of the seal, and a grip formed at the outer side of the lever body.

The lever may further comprise an inner wall formed around the through hole, an outer wall formed at an outer circumferential edge of the lever, and a plurality of rails provided on the lever body. The rails may be constituted by a plurality of first rails formed to extend in a circumferential direction adjacent to the inner wall, and a plurality of second rails formed between the first rails and the outer wall of the lever body.

Advantageously, the first and second rails are formed to slope upwardly in the circumferential direction, and each of the second rails is provided with an internal slot defined by respective first and second rail walls. Preferably, each second rail wall is formed between the respective first rail wall and the respective first rail.

In a preferred embodiment, the guide member is substantially cylindrical, and further comprises a plurality of first guide projections formed at a side wall of the guide member, the first guide projections each having a slope corresponding to the slope of the first rails, and a plurality of second guide projections each of which is formed and configured so as to be insertable into the space between the respective first and second rail walls.

Preferably, a release prevention member is formed at one side of each of the second guide projections to prevent that second guide projection from disengaging from the respective second rails. Conveniently, the release prevention member is hook shaped.

The invention will now be described in greater detail, by way of example, with reference to the drawings, in which:

Figure 1 is a schematic view illustrating a cyclonic separator having a conventional attachment device for a dust-collecting receptable;

Figure 2 a cross-sectional view illustrating a cyclonic separator having a releasable attachment device for a dust-collecting receptacle, the device being constructed according to the invention;

Figure 3 is an exploded perspective view illustrating the main parts of the attachment device of Figure 2;

Figure 4 is a perspective view, looking from underneath, showing a lever of the attachment device shown in Figures 2 and 3;

Figure 5 is a cross-sectional view illustrating a seal of the attachment device of Figures 2 and 3; and

Figure 6 is a side view, in partial cross-section, illustrating how the dust-collecting receptacle is detached from the cyclonic separator by operation of the attachment device of Figures 2 and 3.

Referring to the drawings, Figure 2 shows a dust-collecting receptacle 110 coupled to a cyclonic separator 90 by a releasable attachment device 140. The cyclonic separator 90 includes a cyclone body 100 and the dust-collecting receptacle 110.

The cyclone body 100 centrifugally separates and discharges dust from air drawn into the cyclonic separator 90. An air inlet 99 is formed at one side of the wall defining the cyclone body 100, through which inlet the dirt-carrying air is drawn in. A grille 113 is disposed in the cyclone body 100 to provide an initial separation of dust from the air. A dust-backflow-prevention member 115 is disposed under the grille 113, this member having a predetermined separation from the inner surface 117 of the cyclone body 100.

The dust-collecting receptacle 110 is detachably coupled to the lower part of the cyclone body 100, and includes an air discharge path 111 which provides direct fluid communication with the grille 113. A space formed around the discharge path 111 of the dust-collecting receptacle 110 collects the dust separated in the cyclone body 100.

A filter case 120 is detachably disposed under the dust-collecting receptacle 110, the filter case housing a filter assembly 121 as shown. The filter case 120 is securely coupled to dust-collecting receptacle 110 by the attachment device 140. The filter assembly 121 provides for secondary separation of the fine dust which remains entrained in the air drawn in through the discharge path 111, the filter assembly being coaxially disposed about the discharge path 111.

A motor (not shown) is installed in a motor chamber 131 provided within a motor cover 130 to generate a suction force within the cyclone body 110.

The releasable attachment device 140 is interposed between the filter case 120 and the motor cover 130, and provides a guide for the air discharged from the filter case to direct it into the motor chamber 131. The releasable attachment device 140 provides a fluid seal for air flowing between the filter case 120 and the motor chamber 131, and can also move the filter case upwardly and downwardly.

The releasable attachment device 140 will now be described in greater detail with reference to Figures 3 to 5. The device 140, includes a lever 160 and a seal 150 (see Figure 3), the lever being shown in greater detail in Figure 4, and the seal being shown in greater detail in Figure 5.

The releasable attachment device 140 includes the seal 150, the lever 160, and a guide member 190, the guide member being formed on the motor cover 130. The seal 150 includes a sealing body 155, a first sealing part 151, a second sealing part 153, and a coupling rail 157. The sealing body 155 is in the shape of an annular cylinder, and defines an internal aperture through which the drawn-in air flows.

The sealing body 155 is substantially cylindrical and includes an upper inlet 152 and a lower outlet 154, as shown in Figure 5. The inlet 152 is connected to the filter case 120, and the outlet 154 is connected to the motor cover 130. The first sealing part 151 is formed around the inlet 152 to seal the air discharged from the filter case 120. The second sealing part 153 is formed around the outlet 154 to seal the air discharged into motor chamber 131. The first and second sealing parts 151 and 153 protrude axially away from the outer surface of the cylindrical sealing body 155. The seal 150 is preferably made of a resilient material such as rubber. The coupling rail 157 is formed on the outer surface of the sealing body 155, and is configured to couple with an annular flange 163 (see Figure 4) formed on the lever 160, when the lever surrounds the sealing member 150.

Referring to Figure 4, the lever 160 includes a lever body 161, the annular flange 163, and a plurality of rails 171. An annular through hole 162, is defined by the lever body 161, the through hole being circular or substantially circular in cross-section. The annular flange 163 protrudes along an inner wall 164 formed around the through hole 162, and extends radially inwardly from the inner wall to couple with the coupling rail 157 of the seal 150 (see Figure 5).

The inner wall 164 and an outer wall 173 of the lever body 161 are cylindrical, or substantially cylindrical, to define the annular shape of the lever body. The rails 171 are formed between the inner wall 164 and the outer wall 173, and include a plurality of first rails 167 and a plurality of second rails 169.

A grip 179 is formed on, or attached to, the lever body 161 to provide means for moving or rotating the lever 160.

Each of the first rails 167 is formed to slope upwardly as it extends in a circumferential direction adjacent to the inner wall 164. Each of the second rails 169 is formed between a respective first rail 167 and the outer wall 173 of the lever body 161, and slopes in the same orientation and direction as it extends in a circumferential direction. Each second rail 169 is defined by two upstanding walls which define an opening therebetween. A respective second rail wall 165 is formed around each second rail 169.

As shown in Figure 3, the guide member 190 is formed on the motor cover 130 for guiding the movement of the lever 160. The guide member 190 includes first guide projections 191 and second guide projections 193. The first guide projections 191 protrude upwardly from an end wall 192 which extends cylindrically around a central aperture provided in the top of the motor cover 130. Each first guide projection 191 has a slope to correspond to the slope of the associated first rail 167 of the lever 160. Although two first guide projections 191 are shown, more than two can be provided.

Each second guide projection 193 is formed to be insertable into the opening between the two upstanding walls 165 of the respective second rail 169 of the lever 160 (see Figure 4). A respective outwardly-extending, release prevention member 197 is formed at one side of each second guide projection 193 so as to prevent that second guide projection from releasing the associated second rail 169 of the lever 160 when they are engaged. Each release prevention member 197 is hook-shaped, and may include a locking device to prevent the respective second guide projection 193 from releasing engagement with the associated second rail 169.

Referring to Figures 2 to 6, the operation of the releasable attachment device 140 will now be described. Figure 6 shows the dust-collecting receptacle 110 in a withdrawn position when it is detached from the cyclonic separator 90 by the operation of the lever 160.

When a suction force is generated by the motor (not shown) in the motor chamber 131, the dust-carrying air is drawn in through the inlet 99 of the cyclone body 100. The drawn-in air forms a whirling air stream in the cyclone body 100, and the dust is separated from the air by the centrifugal force of the cyclonic whirling air stream. The dust, once separated from the whirling air cyclone, falls under gravity, and is collected in the dust-collecting receptacle 110. The "clean" air then flows through the grille 113 and the discharge path 111 in the dust-collecting receptacle 110, and is discharged to the filter case 120.

Fine dust which is separated by the filter assembly 121 of the filter case 120 is collected in the dust-collecting receptacle 120, and the clean air flows through the releasable attachment device 140, as shown by the arrows in Figure 2. The clean air flows through the seal 150 of the attachment device 140, and is discharged to the outside via the motor cover 130 and a discharge grille (not shown).

When a predetermined amount of dust is collected in the dust-collecting receptacle 110 or in the filter case 120, the dust requires disposal. Disposal is effected by detaching the filter case 120 or the dust-collecting receptacle 110 from the cyclone body 100. This is accomplished by a user moving the grip 179 of the lever 160 to the right, so that the rails 171 cause the rotation and displacement of the lever body 161, which is in close contact with the first and second guide projections 191 and 193 of the guide member 190.

The first and second guide projections 191 and 193 are fixed to, and project upwardly from, the motor cover 130, so that the lever 160 moves up and down as the rails 167 and 169 slide on the projections.

The coupling rail 157 of the seal 150 is coupled with the annular flange 163 of the lever 160 to guide the rotation of the lever. Thus, when the lever 160 moves to the right or left, it moves upwardly or downwardly, respectively, along the guide member 190 of the motor cover 130.

When moving along the guide member 190, the lever 160 moves together with the seal 150, that is to say the lever rotates in a predetermined direction to cause the vertical displacement of the lever and the seal. Accordingly, the seal 150 seals the filter case 120 with respect to the motor cover 130, and seals the dust-collecting receptacle 110 with respect to the filter case 120, when in the upper operational position. In order to dispose of collected dust, the lever 160 and the seal 150 are lowered by movement of the grip 179 towards the left, so as to cause the downwards displacement of the assembly, thereby permitting the dust-collecting receptacle 110 to be detached from the cyclone body 100.

Since the filter case 120 is securely fixed to the attachment device 140, the dust-collecting receptacle 110 alone is detached from the cyclone body 100. When replacing the dust-collecting receptacle 110 inside the cyclone body 100, the grip 179 is displaced towards the right, thus vertically raising the assembly of the lever 160 and the seal 150 until it seals against the lower surface of the filter case 120.

As shown in Figure 6, when the grip 179 of the attachment device 140 is moved to the left, the filter case 120 moves downwardly, and the dust-collecting receptacle 110 becomes detachable from the cyclone body 100. As shown in Figure 2, when the grip 179 is moved towards the right, the filter case 120 and the dust-collecting receptacle 110 move upwardly, and so are again attached to the cyclone body 100.

After detaching the dust-collecting receptacle 110 from the filter case 120 and the cyclone body 100, the user can dispose of the dust collected in the receptacle. The fine dust collected in the filter case 120, which itself is detachable from the dust-collecting receptacle 110, can also be disposed of.

After disposing of the dust, the dust-collecting receptacle 110 is again attachable to the cyclone body 100 and the filter case 120. The user mounts the dust-collecting receptacle 110 between the cyclone body 100 and the filter case 120, and moves the lever 160 to the right.

Accordingly, the user can easily attach the dust-collecting receptacle 110 to the cyclonic separator 90, and can easily detach it therefrom by use of the attachment device 140.

While the dust-collecting receptacle 110 is attached to the cyclonic separator 90, the attachment device 140 also seals the fluid communication path between the filter case 120 and the motor chamber 131. Therefore, leakage of the suction force of the motor is inhibited, and so the dust-collecting capacity of the cyclonic separator 90 is enhanced.

While an embodiment of the present invention has been described, additional variations and modifications of the described embodiment may occur to those skilled in the art once they achieve an understanding of the basic inventive concepts. Therefore, it is intended that the appended claims shall be construed to include both the above embodiments and all such variations and modifications.

Claims

1. A releasable attachment device for attaching a dust-collecting receptacle to a vacuum cleaner cyclone body, the device comprising:

a seal for closing the dust-collecting receptacle with respect of part of the vacuum cleaner, the seal having a central through hole defining a fluid communication path;

a lever surrounding the seal; and

a guide member for guiding displacement of the lever,

wherein the lever is displacable upwardly or downwardly depending on the direction of its movement relative to the guide member.

2. A device as claimed in claim 1, wherein the seal comprises:

an annular sealing body having an inlet and an outlet;

a first sealing part formed around the inlet;

a second sealing part formed around the outlet; and

a coupling rail formed around the sealing body to engage with the lever and seal thereagainst.

3. A device as claimed in claim 2, wherein the first and second sealing parts protrude radially outwardly from an outer surface of the sealing body.

4. A device as claimed in claim 2 or claim 3, wherein the lever comprises:

a lever body having a through hole for receiving the seal;

an annular flange formed around the through hole of the lever body to engage with the coupling rail of the seal, and

a grip formed at the outer side of the lever body.

5. A device as claimed in claim 4, wherein the lever further comprises:

an inner wall formed around the through hole;

an outer wall formed at an outer circumferential edge of the lever; and

a plurality of rails provided on the lever body.

6. A device as claimed in claim 5, wherein the rails are constituted by:

a plurality of first rails formed to extend in a circumferential direction adjacent to the inner wall; and

a plurality of second rails formed between the first rails and the outer wall of the lever body.

7. A device as claimed in claim 6, wherein the first and second rails are formed to slope upwardly in the circumferential direction, and each of the second rails is provided with an internal slot defined by respective first and second rail walls.

8. A device as claimed in claim 7, wherein each second rail wall is formed between the respective first wall and the respective first rail.

9. A device as claimed in claim 7 or claim 8, wherein the guide member is substantially cylindrical and further comprises:

a plurality of first guide projections formed at a side wall of the guide member, the first guide projections each having a slope corresponding to the slope of the first rails; and

a plurality of second guide projections, each of which is formed and configured so as to be insertable into the space between the respective first and second rail walls.

10. A device as claimed in claim 9, wherein a respective release prevention member is formed at one side of each of second guide projections to prevent that second guide projection from disengaging from the respective second rails.

11. A device as claimed in claim 11, wherein the release prevention member is hook shaped.